MARSH SURFACE ELEVATION RESPONSE TO WATER LEVEL VARIATIONS IN A STRESSED *SPARTINA ALTERNIFLORA* MARSH (OLD OYSTER BAYOU)

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Surface Elevation Table (SET) measurements were first taken in 1992 at Old Oyster Bayou (OOB), which is historically a very healthy *Spartina alterniflora* marsh due to its close proximity to the Atchafalaya River mouth. Prior to the full-scale awareness of the marsh dieback event, three new instruments were deployed at OOB to gain a better understanding of marsh surface elevation processes. Two instruments were new versions of the original SET, one driven to a depth of 18 m (Rod SET) and the other anchored in the top 0.35 m designed to isolate the active root zone (Shallow SET). In addition, an ultrasonic sensor was included to record measurements of surface elevation every 15 minutes in conjunction with marsh porewater levels. Since the deployment of these instruments, OOB vegetation has shown significant signs of stress throughout the summer although mortality has not occurred.

Coastal Louisiana water levels are essentially wind-driven with tidal signatures often overridden due to the small tidal range in the northern gulf coast. The data collected at OOB reflect this showing prolonged drawdowns in regional water levels in response to westerly and northerly winds. A concomitant lowering of marsh water levels occurred via evapotranspiration. Interestingly, marsh surface elevation data are highly correlated with marsh water level perturbations. As water levels rise in the marsh following a drawdown,

surface elevation rebounds rapidly to approximately its previous level. During the most extreme water level drawdown measured (-18 cm), however, marsh surface elevation showed a much more delayed response following water level increases and did not show a 100% recovery until after 5 weeks. This result suggests that a large drawdown event for several weeks may add additional stress to the marsh vegetation due to lack of easily extractable water. Data from the three versions of SET's reveal that as marsh water level drops, the marsh surface elevation decreases because of dewatering and compaction of the substrate below the root zone. The root matrix remains intact and moves vertically with changes in water status below the root zone. Together, these data suggest that sediment composition may play an important role in water retention and availability and may have been a factor in the spatial distribution of the brown marsh phenomenon.